PATENT CLAIMS

1. A phase shifter arrangement (10; 91, .., 98), in particular for electrically pivoting the irradiation direction of an antenna array (105), which comprises two or more radiators (106, .., 114) having two polarization planes, which phase shifter arrangement (10; 91, .., 98) comprises two phase shifters (10a, b; 91a, b, .., 98a, b), which can be altered at the same time, having associated microstrip lines (66, 67; 90a, b), whose electrical length can in each case be altered by means of a dielectric (70) which is arranged such that it can be displaced over the microstrip lines (66, 67; 90a, b), characterized in that the microstrip lines (66, 67; 90a, b) of the two phase shifters (10a, b; 91a, b, .., 98a, b) are arranged parallel and next to one another, and in that a common, displaceable dielectric (70) is provided for the purpose of altering the electrical length of the microstrip lines (66, 67; 90a, b) of the two phase shifters (10a, b; 91a, b, .., 98a, b).

2. The phase shifter arrangement as claimed in claim 1, characterized in that the microstrip lines (66, 67; 90a, b) and the displaceable arrangement of the dielectric (70) are designed such that the electrical length of the two parallel microstrip lines (66, 67; 90a, b) is altered to the same extent when the dielectric (70) is displaced.

3. The phase shifter arrangement as claimed in either of claims 1 or 2, characterized in that the microstrip lines (66, 67; 90a, b) extend essentially along a longitudinal axis (11), and in that the dielectric (70) can be displaced in the direction of the longitudinal axis (11).

4. The phase shifter arrangement as claimed in claim 3, characterized in that the microstrip lines (66, 67; 90a, b) each have at least one center piece (66b, 67b; 91a, b, .., 98a, b) which is completely overlapped by the displaceable dielectric (70) in a first position and is left completely free in a second position.

5. The phase shifter arrangement as claimed in claim 4, characterized in that the microstrip lines (66, 67; 90a, b) in the center pieces (66b, 67b; 91a, b, .., 98a, b) run transversely with respect to the longitudinal direction (11) and have a meandering structure.

6. The phase shifter arrangement as claimed in claim 5, characterized in that two or more line sections (66d, .., h) running parallel in the longitudinal direction (11) are provided within the meandering structure, and in that the microstrip lines (66, 67; 90a, b) alter their strip width in the line sections (66d, .., h) running in the longitudinal direction (11).

7. The phase shifter arrangement as claimed in claim 6, characterized in that, when the dielectric (70) is displaced from the second to the first position, the strip width of the overlapped line sections (66d, .., h), starting from a minimum strip width, increases as the overlap increases up to a maximum strip width.

8. The phase shifter arrangement as claimed in claim 7, characterized in that the strip width increases linearly with the displacement path in the longitudinal direction (11).

9. The phase shifter arrangement as claimed in either of claims 7 or 8, characterized in that the minimum strip

width is selected such that, when there is an overlap with the dielectric (70) in the region of the minimum strip width, the same characteristic impedance of the microstrip lines (66, 67; 90a, b) is produced as in the region of the maximum strip width where there is no overlap with the dielectric (70).

10. The phase shifter arrangement as claimed in one of claims 6 to 9, characterized in that adjusting pieces (68, 69) having a differing strip width are arranged in the line sections (66d, .., h) running in the longitudinal direction (11) for the purpose of adjusting the characteristic impedance.

11. The phase shifter arrangement as claimed in one of claims 1 to 10, characterized in that the microstrip lines (66, 67; 90a, b) of the two phase shifters (10a, b; 91a, b, .., 98a, b) are arranged and formed on a common printed circuit board (60, 90).

12. The phase shifter arrangement as claimed in claim 11, characterized in that the microstrip lines (66, 67; 90a, b) of the two phase shifters (10a, b; 91a, b, .., 98a, b) are designed to be mirror-symmetrical with respect to a center axis (11), running parallel to the longitudinal axis, of the printed circuit board (60, 90).

13. The phase shifter arrangement as claimed in one of claims 1 to 12, characterized in that the microstrip lines (66, 67; 90a, b) of the two phase shifters (10a, b; 91a, b, .., 98a, b) and the common dielectric (70) above are pressed flat against one another by means of a spring metal sheet (40).

14. The phase shifter arrangement as claimed in claim

13, characterized in that the spring metal sheet (40) is arranged on the underside of the microstrip lines (66, 67; 90a, b) and is electrically insulated from the microstrip lines (66, 67; 90a, b) by means of an intermediate insulating plate (50), and in that the spring metal sheet (40) has a plurality of individual spring tongues (45) distributed over its surface.

15. The phase shifter arrangement as claimed in one of claims 1 to 14, characterized in that a slide (80) is provided, which is guided displaceably in the longitudinal direction (11), can be actuated manually from the outside or using a motor, and is in engagement with the dielectric (70).

16. The phase shifter arrangement as claimed in one of claims 1 to 15, characterized in that a plate having a relative dielectric constant of approximately 10, in particular in the form of a glass fiber-reinforced, organoceramic laminate, is used as the dielectric (70).

17. An antenna array (105) having a plurality of radiators (106, .., 114), which are arranged one behind the other in a longitudinal direction (11), and each comprise two radiator elements (106a, b) provided for different polarization planes, and are connected to two supply inputs (99a, b) via a supply network (115; 115a, b), characterized in that phase shifter arrangements (10; 91, .., 98) as claimed in one of claims 1 to 16 are arranged within the supply network (115; 115a, b) and are individually associated with the radiators (106, .., 114).

18. The antenna array as claimed in claim 17, characterized in that two or more phase shifter

arrangements (10; 91, .., 98) which can be displaced at the same time are arranged one behind the other within the supply network (115; 115a, b), and in that connections (102a, b, .., 104a, b) are provided between and downstream of the phase shifter arrangements (10; 91, .., 98) for the purpose of connecting the radiators (106, .., 114).

19. The antenna array as claimed in claim 18, characterized in that radiators (106, .., 114) are arranged in the antenna array 2n+1 (n=1, 2, 3, ...), in that 2n phase shifter arrangements are arranged one behind the other in the associated supply network (115; 115a, b), in that the supply inputs (99a, b) are connected to the supply network (115; 115a, b) between the n-th and the (n+1)-th phase shifter arrangement, and in that all of the phase shifter arrangements can be actuated at the same time, the first n phase shifter arrangements operating in opposition to the second n phase shifter arrangements.

20. The antenna array as claimed in one of claims 17 to 19, characterized in that the supply network (115, 115a, b) and the phase shifter arrangements (10; 91, .., 98) are arranged on a common printed circuit board (90).